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Adventures in diet

Chicago

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Adventures in Diet

By

VILHJALMUR STEFANSSON

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ADVENTURES IN DIET*

BY VILHJALMUR STEFANSSON

PART I

IN 1906 I went to the Arctic with the food tastes and beliefs of the average American. By 1918, after eleven years as an Eskimo among Eskimos, I had learned things which caused me to shed most of those beliefs. Ten years later I began to realize that what I had learned was going to influence materially the sciences of medicine and dietetics. However, what finally impressed the scientists, and converted many during the last two or three years, was a series of confirmatory experiments upon myself and a colleague performed at Bellevue Hospital, New York City, under the supervision of a committee representing several universities and other scientific organizations.

Not so long ago the following dietetic beliefs were common: To be healthy you needed a varied diet, composed of elements from both the animal and vegetable kingdoms. You got tired of and eventually felt a revulsion against things if you had to eat them often. This latter belief was supported by stories of people who through force of circumstances had been compelled, for instance, to live for two weeks on sardines and crackers and who, according to the stories, had sworn that so long as they lived they never would touch sardines again. The Southerners had it that nobody can eat a quail a day for thirty days.

There were subsidiary dietetic views. It was desirable to eat fruits and vegetables, including nuts and coarse grains. The less meat you ate the better for you. If you ate a good deal of it you would develop rheumatism, hardening of the arteries, and high blood pressure, with a tendency to breakdown of the kidneys—in short, premature old age. An extreme variant had it that you would live more healthily, happily, and longer if you became a vegetarian.

Specifically it was believed, when our field studies began, that without vegetables in your diet you would develop scurvy. It was a "known fact" that sailors, miners, and explorers frequently died of scurvy "because they did not have vegetables and fruits." This was long before Vitamin C was publicized.

The addition of salt to food was considered either to promote health or to be necessary for health. This was proved by various yarns, such as that African tribes make war on one another to get salt; that

* In this reprint of a series of magazine articles, proof corrections have been made by the author. For expressions like "as stated in a previous article" have been substituted things like "ante" or "as said above." Misprints and slips in previous editing have been corrected, some ambiguities have been clarified, and two or three sentences have been struck out because they were jarringly repetitious.

minor campaigns of the American Civil War were focussed on salt mines; and that all herbivorous animals are ravenous for salt. I do not remember seeing a critical appendix to any of these views, suggesting, for instance, that negro tribes also make war about things which no one ever said were biological essentials of life; that tobacco was a factor in Civil War campaigns without being a dietetic essential; and that members of the deer family in Maine, which never have salt or show desire for it, are about as healthy as those of Montana which devour quantities of it and are forever seeking more.

A belief I was destined to find crucial in my Arctic work, making the difference between success and failure, life and death, was the view that man cannot live on meat alone. The few doctors and dietitians who thought you could were considered unorthodox, if not charlatans. The arguments ranged from metaphysics to chemistry: Man was not intended to be carnivorous—you knew that from examining his teeth, his stomach, and the account of him in the Bible. As mentioned, he would get scurvy if he had no vegetables, and there are no vegetables in meat. The kidneys would be ruined by overwork. There would be protein poisoning and, in general, hell to pay.

With these views in my head and, deplorably, a number of others like them, I resigned my position as assistant instructor in anthropology at Harvard to become anthropologist of a polar expedition. Through circumstances and accidents which are not a part of the story, I found myself that autumn the guest of the Mackenzie River Eskimos.

The Hudson's Bay Company, whose most northerly post was at Fort Macpherson two hundred miles to the south, had had little influence on the Eskimos during more than half a century; for it was only some of them who made annual visits to the trading post; and then they purchased no food but only tea, tobacco, ammunition, and things of that sort. But in 1889 the whaling fleet had begun to cultivate these waters and for fifteen years there had been close association with sometimes as many as a dozen ships and four to five hundred men wintering at Herschel Island, just to the west of the delta. During this time a few of the Eskimos had learned some English, and perhaps one in ten of them had grown to a certain extent fond of white men's foods.

But now the whaling fleet was gone because the bottom had dropped out of the whalebone market, and the district faced an old-time winter of fish and water. The game, which might have supplemented the fish some years earlier, had been exterminated or driven away by the intensive hunting that supplied meat to the whaling fleet. There was a little tea, but not nearly enough to see the Eskimos through the winter—this was the only element of the white man's dietary of which they were really fond and the lack of which would worry them. So I was facing a winter of fish without tea, for the least I could do, an uninvited guest, was to pretend a dislike for it.

The issue of fish and water against fish and tea was, in any case, to me six against half dozen. For I had had a prejudice against fish all my life. I had nibbled at it

perhaps once or twice a year at course dinners, always deciding that it was as bad as I thought. This was pure psychology, of course, but I did not realize it.

I was in a measure adopted into an Eskimo family the head of which knew English. He had grown up as a cabin boy on a whaling ship and was called Roxy, though his name was Memoranna. It was early September, we were living in tents, the days were hot, but it had begun to freeze during the nights, which were now dark for six or eight hours.

The community of three or four families, fifteen or twenty individuals, was engaged in fishing. With long poles, three or four nets were shoved out from the beach about one hundred yards apart. When the last net was out the first would be pulled in, with anything from dozens to hundreds of fish, mostly ranging in weight from one to three pounds, and including some beautiful salmon trout. From knowledge of other white men, the Eskimos considered the trout most suitable for me and would cook them specially, roasting them against the fire. They themselves ate boiled fish.

Trying to develop an appetite, my habit was to get up soon after daylight, say four o'clock, shoulder my rifle, and go off breakfastless on a hunt south across the rolling prairie, though I scarcely expected to find any game. About the middle of the afternoon I would return to camp. Children at play usually saw me coming and reported to Roxy's wife, who would then put a fresh salmon trout to roast. When I got home I would nibble at it and write in my diary what a terrible time I was having.

Against my expectation, and almost against my will, I was beginning to like the baked salmon trout when one day of perhaps the second week I arrived home without the children having seen me coming. There was no baked fish ready but the camp was sitting round troughs of boiled fish. I joined them and, to my surprise, liked it better than the baked. Thereafter the special cooking ceased and I ate boiled fish with the Eskimos.

II

By midwinter I had left my cabin-boy host and, for the purposes of anthropological study, was living with a less sophisticated family at the eastern edge of the Mackenzie delta. Our dwelling was a house of wood and earth, heated and lighted with Eskimo-style lamps. They burned seal or whale oil, mostly white whale from a hunt of the previous spring when the fat had been stored in bags and preserved, although the lean had been eaten. Our winter cooking, however, was not done over the lamps but on a sheet-iron stove which had been obtained from whalers. There were twenty-three of us living in one room, and there were sometimes as many as ten visitors. The floor was then so completely covered with sleepers that the stove had to be suspended from the ceiling. The temperature at night was round 60° F. The ventilation was excellent through cold air coming up slowly from below by way of a trap door that was never closed and the heated air going out by a ventilator in the roof.

Everyone slept completely naked —no pajamas or night shirts. We

used cotton or woolen blankets which had been obtained from the whalers and from the Hudson's Bay Company.

In the morning, about seven o'clock, winter-caught fish, frozen so hard that they would break like glass, were brought in to lie on the floor till they began to soften a little. One of the women would pinch them every now and then until, when she found her finger indented them slightly, she would begin preparations for breakfast. First she cut off the heads and put them aside to be boiled for the children in the afternoon (Eskimos are fond of children, and heads are considered the best part of the fish). Next best are the tails, which are cut off and saved for the children also. The woman would then slit the skin along the back and also along the belly and, getting hold with her teeth, would strip the fish somewhat as we peel a banana, only sideways where we peel bananas endways.

Thus prepared, the fish were put on dishes and passed around. Each of us took one and gnawed it about as an American does corn on the cob. An American leaves the cob; similarly, we ate the flesh from the outside of the fish, not touching the entrails. When we had eaten as much as we chose, we put the rest on a tray for dog feed.

After breakfast all the men and about half the women would go fishing, the rest of the women staying at home to keep house. About eleven o'clock we came back for a second meal of frozen fish just like the breakfast. At about four in the afternoon the working day was over and we came home to a meal of hot boiled fish.

Also we came home to a dwelling so heated by the cooking that the temperature would range from 85° to 100° F. or perhaps even higher —more like our idea of a Turkish bath than of a warm room. Streams of perspiration would run down our bodies, and the children were kept busy going back and forth with dippers of cold water, of which we naturally drank great quantities.*

Just before going to sleep we would have a cold snack of fish that had been left over from dinner. Then we slept seven or eight hours and the routine of the day began once more.

After some three months as a guest of the Eskimos I had acquired most of their food tastes. I had come to agree that fish is better boiled than cooked any other way, and that the heads (which we occasionally shared with the children) were the best part of the fish. I no longer desired variety in the cooking, such as occasional baking — I preferred it always boiled if it was cooked. I had become as fond of raw fish as if I had been a Japanese. I liked fermented (therefore slightly acid) whale oil with my fish as well as ever I liked mixed vinegar and olive oil with a salad. But I still had two reservations against Eskimo practice: I did not eat rotten fish and I longed for salt with my meals.

There were several grades of decayed fish. The August catch had been protected by logs from animals but not from the heat and was outright rotten. The September catch was midly decayed. The October and later catches had been frozen immediately and were fresh. There was less of the August fish than of any other and, for that reason among the rest, it was a delicacy — eaten sometimes as a snack between meals, sometimes as a kind of dessert, and always frozen, raw.

*In the house grown men and women wore trunks—they were naked from the waist up and from the knees down. Children were completely naked.

In midwinter it occurred to me to philosophize that in our own and foreign lands taste for a mild cheese is somewhat plebeian; it is at least a semi-truth that connoisseurs like their cheeses progressively stronger. The grading applies to meats, as in England where it is common among nobility and gentry to like game and pheasant so high that the average Midwestern American, or even Englishman of a lower class, would call them rotten.

I knew of course that, while it is good form to eat decayed milk products and decayed game, it is very bad form to eat decayed fish. I knew also the view of our populace that there are likely to be "ptomaines" in decaying fish and in the plebeian meats; but it struck me as an improbable extension of class-consciouness that ptomaines would avoid the gentleman's food and attack that of the commoner.

The thoughts led to a summarizing query: If it is almost a mark of social distinction to be able to eat strong cheeses with a straight face and smelly birds with a relish, why is it necessarily a low taste to be fond of decaying fish? On that basis of philosophy, though with several qualms, I tried the rotten fish one day, and, if memory serves, liked it better than my first taste of Camembert. During the next weeks I became fond of rotten fish.

About the fourth month of my first Eskimo winter I was looking forward to every meal (rotten or fresh), enjoying them, and feeling comfortable when they were over. Still I kept thinking the boiled fish would taste better if only I had salt. From the beginning of my Eskimo residence I had suffered from this lack. On one of the first few days, with the resourcefulness of a Boy Scout, I had decided to make myself some salt, and had boiled sea water until there was left only a scum of brown powder. If I had remembered as vividly my freshman chemistry as I did the books about shipwrecked adventurers, I should have known in advance that the sea contains a great many chemicals besides sodium chloride, among them iodine. The brown scum tasted bitter rather than salty. A better chemist could no doubt have refined the product. I gave it up, partly through the persuasion of my host, the English-speaking Roxy.

The Mackenzie Eskimos, Roxy told me, believe that what is good for grown people is good for children and enjoyed by them as soon as they get used to it. Accordingly they teach the use of tobacco when a child is very young. It then grows to maturity with the idea that you can't get along without tobacco. But, said Roxy, the whalers have told that many whites get along without it, and he had himself seen white men who never use it, while of the few white women, wives of captains, none used tobacco. (This, remember, was in 1906.)

Now Roxy had heard that white people believe salt is good for, and

even necessary for, children; so they begin early to add salt to the child's food. That child then would grow up with the same attitude toward salt as an Eskimo has toward tobacco. However, said Roxy, since we Eskimos were mistaken in thinking tobacco so necessary, may it not be that the white men are mistaken about salt? Pursuing the argument, he concluded that the reason why all Eskimos dislike salted food and all white men like it was not racial but due to custom. You could, then, break the salt habit as easily as the tobacco habit and you would suffer no ill result beyond the mental discomfort of the first few days or weeks.

Roxy did not know, but I did as an anthropologist, that in pre-Columbian times salt was unknown, or the taste of it disliked and the use of it avoided, through much of North and South America. It may possibly be true that the carnivorous Eskimos, in whose language the word salty, *mamaitok*, is synonymous with evil-tasting, disliked salt more intensely than those Indians who were partly herbivorous. Nevertheless, it is clear that the salt habit spread more slowly through the New World from the Europeans than the tobacco habit through Europe from the Indians. Even to-day there are considerable areas, for instance in the Amazon basin, where the natives still abhor salt. Not believing that the races differ in their basic natures, I felt inclined to agree with Roxy that the practice of salting food is with us a social inheritance and the belief in its merits a part of our folklore.

Through this philosophizing I was somewhat reconciled to going without salt, but I was, nevertheless, overjoyed when one day Ovayuak, my new host in the eastern delta, came indoors to say that a dog team was approaching which he believed to be that of Ilavinirk, a man who had worked with whalers and who possessed a can of salt. Sure enough it was Ilavinirk, and he was delighted to give me the salt, a half-pound baking-powder can about half full, which he said he had been carrying around for two or three years, hoping sometime to meet someone who would like it for a present. He seemed almost as pleased to find that I wanted the salt as I was to get it. I sprinkled some on my boiled fish, enjoyed it tremendously, and wrote in my diary that it was the best meal I had had all winter. Then I put the can under my pillow, in the Eskimo way of keeping small and treasured things. But at the next meal I had almost finished eating before I remembered the salt. Apparently then my longing for it had been what you might call imaginary. I finished without salt, tried it at one or two meals during the next few days, and thereafter left it untouched. When we moved camp the salt remained behind.

After the return of the sun I made a journey of several hundred miles to the ship *Narwhal* which, contrary to our expectations of the late summer, had really come in and wintered at Herschel Island. The captain was George P. Leavitt, of Portland, Maine. For the few days of my visit I enjoyed the excellent New England cooking, but when I left Herschel Island I returned without reluctance to the Eskimo meals of fish and cold water. It seemed to me that, mentally and physically, I had never been in better health in my life.

III

During the first few months of my first year in the Arctic I acquired, though I did not at the time fully realize it, the munitions of fact and experience which have within my own mind defeated the views of dietetics reviewed at the beginning of this article. I could be healthy on a diet of fish and water. The longer I followed it the better I liked it, which meant, at least inferentially and provisionally, that you never become tired of your food if you have only one thing to eat. I did not get scurvy on the fish diet nor learn that any of my fish-eating friends ever had it. Nor was the freedom from scurvy due to the fish being eaten raw—we proved that later. (What it was due to we shall deal with in a later part of this statement.) There were certainly no signs of hardening of the arteries and high blood pressure, of breakdown of the kidneys or of rheumatism.

These months on fish were the beginning of several years during which I lived on an exclusive meat diet. For I count in fish when I speak of living on meat, using "meat" and "meat diet" more as a professor of anthropology than as the editor of a housekeeping magazine. The term in this article and in like scientific discussions refers to a diet from which all things of the vegetable kingdom are absent.

To the best of my estimate then, I have lived in the Arctic for more than five years exclusively on meat and water. (This was not, of course, one five-year stretch, but an aggregate of that much time during ten years.) One member of my expeditions, Storker Storkerson, lived on an exclusive meat diet for about the same length of time, while there are several who have lived on it from one to three years. These have been of many nationalities and of three races — ordinary whites; natives of the Cape Verde Islands who had a high percentage of negro blood; and natives of the South Sea Islands. Neither from experience with my own men nor from what I have heard of similar cases do I find any racial difference. There are marked individual differences.

The typical method of breaking a party in to a meat diet is that three to five of us leave in midwinter a base camp which has nearly or quite the best type of mixed diet that money and forethought can provide. The novices have been told that it is possible to live on meat alone. We warn them that it is hard to get used to for the first few weeks, but assure them that eventually they will grow to like it and that any difficulties in changing diets will be due to their imagination.

These assertions the men will believe to a varying degree. I have a feeling that in the course of breaking in something like twenty individuals two or three young men believed me completely, and that this belief collaborated strongly with their youth and adaptability in making them take readily to the meat.

Usually, I think, the men believe that what I tell of myself is true for me personally, but that I am peculiar, a freak—that a normal person will not react similarly, and that they are going to be normal and have an awful time. Their past

experience seems to tell them that if you eat one thing every day you are bound to tire of it. In the back of their minds there is also what they have read and heard about the necessity for a varied diet. They have specific fears of developing the ailments which they have heard of as being caused by meat or prevented by vegetables.

We secure our food in the Arctic by hunting and, in midwinter, there is not enough good hunting light. Accordingly we carry with us from the base camp provisions for several weeks, enough to take us into the long days. During this time, as we travel away from shore, we occasionally kill a seal or a polar bear and eat their meat along with our groceries. Our men like these as an element of a mixed diet as well as you do beef or mutton.

We are not on rations. We eat all we want and we feed the dogs what we think is good for them. When the traveling conditions are right we usually have two big meals a day, morning and evening, but when we are storm-bound or delayed by open water we eat several meals to pass the time away. At the end of four, six, or eight weeks at sea we have used up all our food. We do not try to save a few delicacies to eat with the seal and bear, for experience has proved that such things are only tantalizing.

Suddenly, then, we are on nothing but seal. For while our food at sea averages ten per cent polar bear, there may be months in which we don't see a bear. The men go at the seal loyally; they are volunteers and, whatever the suffering, they have bargained for it and intend to grin and bear it. For a day or two they eat square meals. Then the appetite begins to flag and they discover, as they had more than half expected, that for them personally it is going to be a hard pull or a failure. Some own up that they can't eat, while others pretend to have good appetites, enlisting the surreptitious help of a dog to dispose of their share. In extreme cases, which are usually those of the middle-aged and conservative, they go two or three days practically or entirely without eating. We had no weighing apparatus; but I take it that some have lost anything from ten to twenty pounds, what with the hard work on empty stomachs. They become gloomy and grouchy and, as I once wrote, "They begin to say to each other, and sometimes to me, things about their judgment in joining a polar expedition that I cannot quote."

But after a few days even the conservatives begin to nibble at the seal meat; after a few more they are eating a good deal of it, rather under protest; and at the end of three or four weeks they are eating square meals, though still talking about their willingness to give a soul or a right arm for this or that. Amusingly, or perhaps instructively, they often long for ham and eggs or corned beef when, according to theory, they ought to be longing for vegetables and fruits. Some of them do hanker particularly for things like sauerkraut or orange juice; but more usually it is hot cakes and syrup or bread and butter.

There are two ways in which to look at an abrupt change of diet—how difficult it is to get used to what you have to eat; and how hard it is to be deprived of things

you are used to and like. From the second angle, I take it to be physiologically significant that we have found our people, when deprived, to long equally for things which have been considered necessities of health, such as salt; for things where a drug addiction is considered to be involved, such as tobacco; and for items of what are called staple foods, such as bread.

It has happened on several trips, and with an aggregate of perhaps twenty men, that they have had to break at one time their salt, tobacco, and bread habits. I have frequently tried the experiment of asking which they would prefer: salt for their meat, bread with it, or tobacco for an after-dinner smoke. In nearly every case the men have stopped to consider, nor do I recall that they were ever unanimous.

When we are returning to the ship, after several months on meat and water, I usually say that the steward will have orders to cook separately for each member of the party all he wants of whatever he wants. Especially during the last two or three days there is a great deal of talk among the novices about what the choices are to be. One man wants a big dish of mashed potatoes and gravy; another a gallon of coffee and bread and butter; a third perhaps wants a stack of hot cakes with syrup and butter.

On reaching the ship each does get all he wants of what he wants. The food tastes good, although not quite so superlative as they had imagined. They have said they are going to eat a lot, and they do. Then they get indigestion, headache, feel miserable, and within a week, in nine cases out of ten of those who have been on meat six months or over, they are willing to go back to meat again. If a man does not want to take part in a second sledge journey it is usually for a reason other than dislike of meat.

Still, as just implied, the verdict depends on how long you have been on the diet. If at the end of the first ten days our men could have been miraculously rescued from the seal and brought back to their varied foods, most of them would have sworn forever after that they were about to die when rescued, and they would have vowed never to taste seal again—vows which would have been easy to keep, for no doubt in such cases the thought of seal, even years later, would have been accompanied by a feeling of revulsion. If a man has been on meat exclusively for only two or three months he may or may not be reluctant to go back to it again. But if the period has been six months or over, I remember no one who was unwilling to go back to meat. Moreover, those who have gone without vegetables for an aggregate of several years usually thereafter eat a larger percentage of meat than your average citizen, if they can afford it.

PART II

Now that the experiments in diet which Karsten Andersen and I undertook at Bellevue Hospital have been accepted by the medical world, it is difficult to realize that there could have been such a storm of excitement about the announcement of the plan, such a violent clash of opinions, such near unanimity in the prediction of dire results.

The feeling that decisive controlled tests were needed began to spread after I told one of the scientific heads of the Food Administration in 1918 that I had lived for an aggregate of more than five years with enjoyment on just meat and water. A turning point came in 1920 when I had an hour for explaining a meat regimen to the physicians and staff of the Mayo Clinic. The concluding phase began in 1928 when Mr. Andersen and I entered Bellevue Hospital to give science the first chance in its history to observe human subjects while they lived through the chill of winter and the heat of summer, for twelve months, on an exclusive meat diet. We were to do it under conditions of ordinary city life.

At the beginning of our northern work in 1906 it was the accepted view among doctors and dietitians that man cannot live on meat alone. They believed specifically that a group of serious diseases were either caused directly by meat or preventable only by vegetables. Those views were still being held when, the autumn of 1918, an old friend, Frederic C. Walcott (later Senator from Connecticut), decided that my experiences and the resulting opinions were revolutionary in certain fields, and introduced me to Professor Raymond Pearl of Johns Hopkins, who was then with the U. S. Food Administration in Washigton. Pearl considered several of the things I told him upsetting to views then held; he questioned me before a stenographer, and sent the mimeographed results to a number of dietitians. Their replies varied from concurrence with him (and me) to agreement with David Hume that you are likelier to meet a thousand liars than one miracle.

Pearl was convinced that neither fibs nor miracles were involved and proposed that we write a book on dietetics. I agreed. But cares intervened and things dragged.

In 1920 I had the above-mentioned chance to speak at the Mayo Clinic, Rochester, Minnesota. One of the Mayo brothers suggested that I spend two or three weeks there to have a check-over and see whether they could not find evidences of the supposed bad effects of meat. I wanted to do this but commitments in New York prevented.

Then one day while talking with the gastro-enterologist, Dr. Clarence W. Lieb, I told of my regret that I had not been able to take advantage of the Mayo check-over. Lieb said there were good doctors in New York, too, and volunteered to gather a committee of specialists who would put me through an examination as rigid as anything I could get from the Mayos.

The committee was organized, I went through the mill, and Lieb

reported the findings in the *Journal* of the American Medical Association for July 3, 1926, "The Effects of an Exclusive Long-Continued Meat Diet." The committee had failed to discover any trace of even one of the supposed harmful effects.

With this publication the Lieb and Pearl events merge. For when the Institute of American Meat Packers wrote asking permission to reprint a large number of copies for distribution to the medical profession and to dietitians, Lieb, Pearl and I went into a huddle. The result was a letter to the Institute saying that we refused permission to reprint, but suggesting that they might get something much better worth publishing, and with right to publish it, if they gave a fund to a research institution for a series of experiments designed to check, under conditions of average city life, the problems which had arisen out of my experiences and views. For it was contended by many that an all-meat diet might work in a cold climate though not in a warm, and under the strenuous conditions of the frontier though not in common American (sedentary) business life.

We gave the meat packers warning that, if anything, the institution chosen would lean backward to make sure that nothing in the results could even be suspected of having been influenced by the source of the money.

After much negotiating, the Institute agreed to furnish the money. The organization selected was the Russell Sage Institute of Pathology. The committee in charge was to consist of leaders in the most important sciences that appeared related to the problem, and represented seven institutions:

American Museum of Natural History: Dr. Clark Wissler.

Cornell University Medical College: Dr. Walter L. Niles.

Harvard University: Drs. Lawrence J. Henderson, Earnest A. Hooton, and Percy Howe.

Institute of American Meat Packers: Dr. C. Robert Moulton.

Johns Hopkins University: Drs. William G. McCallum and Raymond Pearl.

Russell Sage Institute of Pathology: Drs. Eugene F. DuBois and Graham Lusk.

University of Chicago: Dr. Edwin O. Jordan.

Unattached: Dr. Clarence W. Lieb (private practice) and Vilhjalmur Stefansson.

The Chairman of the committee was Dr. Pearl. The main research work of the experiment was headed by Dr. DuBois, who is now Physician-in-Chief of the New York Hospital and was then, as he still is, Medical Director of the Russell Sage Institute of Pathology. Among his collaborators were Dr. Walter S. McClellan, Dr. Henry B. Richardson, Mr. V. R. Rupp, Mr. G. F. Soderstrom, Dr. Henry J. Spencer, Dr. Edward Tolstoi, Dr. John C. Torrey, and Mr. Vincent Toscani. The clinical supervision was in charge of Dr. Lieb.

After meetings of the supervising committee, the election of a smaller executive committee, and much discussion, it was decided that, while the experiment would be directed at strictly scientific problems, there might be side glances now and then toward common folk beliefs and the propaganda of certain groups. For instance, our definition of a meat diet as "a diet from which all vegetable elements are excluded" would permit us to use milk and eggs, for they are not vegetables. But some vegetarians are illogical enough to

allow milk and eggs; we agreed to be correspondingly illogical and exclude them. This forestalled the possible cry that we were being saved from the ill effects of a vegetable-less diet by the eggs and the milk.

The aim of the project was not, as the press claimed at the time, to "prove" something or other. We were not trying to prove or disprove anything; we merely wanted to get at the facts. Every aspect of the results would be studied, but special attention would be paid to certain common views, such as that scurvy will result from the absence of vegetable elements, that other deficiency diseases may be produced, that the effect will be bad on the circulatory system and on the kidneys, that certain harmful micro-organisms will flourish in the intestinal tract, and that there will be insufficient calcium. The broad question was, of course, the effect upon the general health as judged by the observations of the supervising doctors and by the testimony of the subjects themselves.

The test was originally planned on me alone, but I might be struck by lightning before conclusions were reached, or I might get run over by a truck, and that would be construed, by mixed-dieters and vegetarians, as showing impairment of mental alertness and bodily vigor through the monotony and poison of meat. It was difficult to find a colleague, for you cannot make this sort of experiment on just anybody. That appears if you consider two elementary cases.

Assume the news of a stock market crash that ruins them is conveyed to a number of people after they have eaten a good meal. Digestion may stop almost at the point of the mental shock. Obviously the sickness which follows that meal is not caused by the food, as such.

Or ask some impressionable friends to dine. Serve them veal, of good quality and well cooked. When dinner is over, you inquire about the veal; they will answer with the usual compliments. Then you say that your case has been proved. Rover died and they have eaten him. If your stage setting and acting have been at all adequate, a few at least of your company will make a dive from the room. What sickens them is not the meat of a dog but the idea that they have eaten dog.

The Russell Sage experiment, then, could not be made upon anybody controlled by strong dietetic beliefs, such as that meat is harmful, that abstinence from vegetables brings trouble, that you tire of a food if you have to eat the same thing often. But almost everyone holds these or similar beliefs. So we were practically compelled to secure subjects from members of one of my expeditions; they were the only living Europeans we knew who had used meat long enough to eliminate completely the mental hazards.

One man fortunately was available. He was Karsten Andersen, a young Dane who had been a member of my third expedition. During that time he had lived an aggregate of more than a year on strictly meat and water, suffering no ill result and, in fact, being on one occasion cured by meat from scurvy which he had contracted on a mixed diet. Moreover, he knew from the experience of a dozen of his colleagues on the expedition that his healthful enjoyment of the

diet was not peculiar to himself but common to all those who had tried it, including members of three races—as said, ordinary whites, Cape Verde Islanders, and South Sea Islanders.

But there were other things which made Andersen almost incredably suitable for our test. For several years he had been working his own Florida orange grove, spending most of practically every day outdoors, lightly clad and enjoying the benefits (such as they are) of sub-tropical sunlight. In that mental and physical environment he had naturally been on a diet heavy in vegetable elements, and had suffered constantly from head colds, his hair was thinning steadily, and he had developed a condition involving intestinal toxaemia* such as would ordinarily cause a doctor to look serious and pronounce: "You must go light on meat" or "I am afraid you'll have to cut out meat entirely."

We could find no one but Andersen whose mind would leave his body unhandicapped. So, in January 1928, the test began with the two of us. It was under the direct charge of Dr. DuBois and his staff in the dietetic ward of Bellevue Hospital, New York City.

A storm of protests from friends broke upon us when the press announced that we were entering Bellevue. These were based mainly upon the report that we were going to eat our meat raw and the belief that we were using lean meat exclusively. The first was just a false rumor; the trouble under the second head was linguistic.

Eating meat raw, our friends chorused, would make us social outcasts. It is proper to serve oysters raw, and clams, in the United States; herring raw in Norway; several kinds of fish raw in Japan; and beef raw almost anywhere in the world if only you change the name and call it rare. The fashion of giving raw meat to infants was spreading, but we were babes neither in years nor stature and could not take advantage of that dispensation.

The answer to the raw meat scare was to explain a basic procedure of our experiments—Andersen and I were to select our food by palate (so long as it was meat) and we were to decide for ourselves how each meal was to be cooked. It proved that usually he leaned to medium cooking and I to well done.

The linguistic trouble came from a recent change of American usage. In Elizabethan English meat was any kind of food, as in the expression "meat and drink." In modern England this has narrowed down to what is implied by the rhyme about Jack Sprat eating no fat and his wife no lean, although they both ate meat. In the United States *meat*, in the last few years, has become a synonym for *lean*. The meaning can become even narrower, as when somebody, usually a woman, tells you that she is strictly forbidden by her physician to touch meat, but that she is permitted all the chicken she wants, with an occasional lamb chop. To that woman *meat* signifies *lean beef*.

In the linguistic sense, then, we pacified our friends by references to Mr. and Mrs. Sprat. Our diet would be of meat in the English sense. We were just going to live under modern conditions on the food of our more or less remote an-

* See statement by Andersen, *post*.

cestors; the food, too, of certain contemporary "primitive hunters."

II

During our first three weeks in Bellevue Hospital we were fed measured quantities of what might be called a standard mixed diet: fruits, cereals, bacon and eggs, that sort of thing for breakfast; meats, vegetables, including fruits, for lunch and dinner. During this time various specialists examined us from practically every angle that seemed pertinent.

Most tedious, and let us hope correspondingly valuable, were the calorimeter studies. With no food since the evening before, we would go in the late morning to the calorimeter room and sit quiet for an hour to get over the physiological effect of having perhaps walked up a single flight of stairs. Then, as effortlessly as we could, we slid into calorimeters which were like big coffins with glass sides, and everybody waited about an hour or so until we had got over the disturbance of having slid in. The box was now closed up, and for three hours we lay there as nearly motionless as we could well be while a corps of scientists visible through the glass puttered about and studied our physiological processes. We were not permitted to read and cautioned even against thinking about anything particularly pleasant or particularly disagreeable, for thoughts and feelings heat or cool you, speed things up or slow them down, play hob generally with "normal" processes.

(Dr. DuBois told of a calorimeter test ruined by mental disturbance. A nervous Roumanian had developed an intense dislike for a fellow-patient named Kelly. During the second hour of an experiment that had been going very well, Max caught a glimpse of the hated Kelly through the window. This raised his metabolism ten per cent during that whole hour.)

With the air we breathed and the rest of our intakes and excretions carefully analyzed, with our blood chemistry determined and a check on such things as the billions of living organisms which inhabit the human intestinal tract, we were ready for the meat.

During the three weeks of mixed diet and preliminary check-up, we had been free to come and go. Now we were placed under lock and key. Neither of us was permitted at any time, day or night, to be out of sight of a doctor or a nurse. This was in part the ordinary rigidity of a controlled scientific experiment, but it was in some part a bow to the skepticism of the mixed-diet advocates and to the emotional storms which were sweeping the vegetarian realms.

Nor was the skepticism and excitement all newspaper talk. One of the leading European authorities, orthodox and belonging to no particular school, was touring the United States. He called on us during the preliminary three weeks and assured the presiding physicians most solemnly that we should be unable to go more than four or five days on meat. He had tried it out himself on experimental human subjects who usually broke down in about three days. These breakdowns, I thought, were of psychological antecedents; but our European authority insisted they were strictly physiological—quite independent of the emotions.

The experiment started smoothly

with Andersen, who was permitted to eat in such quantity as he liked such things as he liked, provided only that they came under our definition of meat—steaks, chops, brains fried in bacon fat, boiled short-ribs, chicken, fish, liver and bacon. In my case there was a hitch, in a way foreseen.

For I had published in 1913, on pages 140-142 of *My Life with the Eskimo*, an account of how some natives and I became ill when we had to go two or three weeks on lean meat, caribou so skinny that there was no appreciable fat behind the eyes or in the marrow. So when Dr. DuBois suggested that I start the meat period by eating as large quantities as I possibly could of chopped fatless muscle, I predicted trouble. But he countered by citing my own experience where illness had not come until after two or three weeks, and he now proposed lean for only two or three days. So I gave in.

The chief purpose of placing me abruptly on exclusively lean was that there would be a sharp contrast with Andersen who was going to be on a normal meat diet, consisting of such proportions of lean and fat as his own taste determined.

As said, in the Arctic we had become ill during the second or third fatless week. I now became ill on the second day. The time difference between Bellevue and the Arctic was due no doubt mainly to the existence of a little fat, here and there, in our northern caribou—we had eaten the tissue from behind the eyes, we had broken the bones for marrow, and in doing everything we could to get fat we had evidently secured more than we realized. At Bellevue the meat, carefully scrutinized, had been as lean as such muscle tissue well can be. Then, in the Arctic we had eaten tendons and other indigestible matter, we had chewed the soft ends of bones, getting a deal of bulk that way when we were trying to secure fat. What we ate at Bellevue contained no bulk material, so that my stomach could be compelled to hold a much larger amount of lean.

The symptoms brought on at Bellevue by an incomplete meat diet (lean without fat) were exactly the same as in the Arctic, except that they came on faster—diarrhoea and a feeling of general baffling discomfort.

Up north the Eskimos and I had been cured immediately when we got some fat. Dr. DuBois now cured me the same way, by giving me fat sirloin steaks, brains fried in bacon fat, and things of that sort. In two or three days I was all right, but I had lost considerable weight.

III

For the first three weeks I was watched day and night by the Institute staff. My exercise was supposed to be about that of an average business man. I went out for walks, but always under guard. If I telephoned, the attendant stood at the door of the booth; if I went into a shop, he was never more than a few feet away; and he was always vigilant. As Dr. DuBois explained, and as I well knew in advance, this was not because the supervising staff were suspicious of me but rather because they wanted to be able to say that they knew of their own knowledge my complete abstinence from all solids and liquids, except those which I received in

Bellevue and which I ate and drank under the watch of attendants.

But my affairs unfortunately demanded that I travel widely through the United States and Canada. This was an added reason why Andersen had been secured for the experiment. When, after three weeks, they had to put me on parole, so to speak, they retained him under lock and key, for a total of something over 90 days.

Those who had believed that a meat diet would lead to death had set at anything from four to fifteen days the point where Dr. Lieb, as clinical supervisor, would have to call a halt in view of danger to the subjects. Those who expected a slower breakdown had placed the appearance of the dread symptoms long before 90 days. In any case, Andersen reported back to the hospital constantly after he left it, and I whenever I was in town.

After my three weeks and Andersen's thirteen, and with the constant analyses of excretions and blood when we came back to the hospital for check-ups, the doctors felt certain they would catch us if we broke diet. Moreover, long before the thirteen weeks ended they had satisfied themselves that Andersen had no longing for fruits or other vegetable materials and, therefore, no motive for breach of contract.

Toward the end of the covenanted year Andersen and I returned to Bellevue for final intensive studies of some weeks on the meat diet, and then our first three weeks on a mixed diet. At this end of the experiment all went smoothly with me, but not so with Andersen.

My trouble, it will be remembered, had been that at the outset they stuffed me with lean, permitting no fat. His difficulty, or at least annoyance, began on the second day after he completed a year on meat (January 25, 1929) when they asked him to eat all the fat he could, to the nausea limit, permitting along with it only a tiny bit of lean, about 45 grams per day. There they kept him, on the verge of nausea, for a week. The second week they added his first taste of vegetables in a year, thrice-cooked cabbage netting about 35 grams of carbohydrate per day. The third week they omitted the cabbage but retained the high proportion of fat to lean.

These three weeks, Andersen says, were the only difficult part of the experiment. Looking back at it now, he thinks if it were possible to separate the nausea from the other unpleasantness there would have been a good deal left over—that he wasn't, properly speaking, well at the end of the third week. However, that is speculation if not imagination.

Returning to facts, we have the ominous one that a pneumonia epidemic was sweeping New York. The hospital was crowded with patients; some of the staff got the disease, and with them Andersen. It was Type II pneumonia in his case, and the physicians were gravely worried, for this type was proving deadly in that epidemic, carrying off fifty per cent of its Bellevue victims. Andersen, however, reacted quickly to treatment, ran an unusually short course, and convalesced rapidly.

IV

The broad results of the experiment were, so far as Andersen and I could tell, and so far as the supervising physicians could tell, that we were in at least as good average health during the year as we had been during the three mixed-diet weeks at the start. We thought our health had been a little better than average. We enjoyed and prospered as well on the meat in midsummer as in midwinter, and felt no more discomfort from the heat than our fellow New Yorkers did.

In view of beliefs that are strangely current, it is worth emphasizing that we liked our meat as fat in July as in January. This ought not to surprise Americans (though it usually does), for they know or have heard that fat pork is a staple and relished food of the Negro in Mississippi. Our Negro literature is rich with the praise of opossum fat, nor did Negroes develop the taste for fats in our Southern States; for Carl Akeley relates from tropical Africa such yarns of fat gorging as have not yet been surpassed from the Arctic. A frequent complaint of travelers in Spain is against foods that swim in oil, and there are similar complaints when we visit rural Latin America. We find, when we stop to think, that many if not most tropical people love greasy food.

Then there is the parallel belief that the largest meat consumption is in cold countries. True, the hundred-percenters are way up north, the Eskimos, Samoyeds, Chukchis. But the heaviest meat eaters who speak English are the Australians, tropical and sub-tropical, while the nearest you come to an exclusive meat diet among people of European stock is in tropical Argentina where the cowboys live on beef and maté. They like their meat fat and (so an Argentinian New Yorker tells me) will threaten to quit work, or at least did twenty years ago, if you attempt to feed them in any considerable part on cereals, greens, and fruits.

It appears that, excepting as tastes are controlled by propaganda and fashion, the longing for fat, summer or winter, depends on what else you eat. If yours is a meat diet, then you simply must have fat with your lean; otherwise you would sicken and die. But since fats, sugars, and starches are in most practical respects dietetically equivalent, you eat more of any one of them if you decrease the combined amount of the other two.

Sir Hubert Wilkins, when we were in the Arctic together, both living exclusively on meat, told me what remains my best single instance of how fats are crowded out by commerce, fashion, and expense. The expense is frequently not the least; fat, which is only about twice as nourishing as sugar, costs, as I write, at my neighborhood grocery 50c a pound (bacon) or 35c (butter) while sugar is only 5½c.

Sir Hubert's father, the first white child born in South Australia, told that when he was young the herdsmen, who were the majority of the population, lived practically exclusively on mutton (sometimes on beef) and tea. At all times of year they killed the fattest sheep for their own use and when in the open, which was frequently, they roasted the fattest parts against a fire with a dripping pan underneath, later dipping the meat into the drippings as they ate. But then gradually commerce developed, breads and pastries be-

gan to be used, jams and jellies were imported or manufactured, and with the advance of starches and sugars, the use of fat decreased. Now, except that the Australians eat rather more meat per year than people do in the British Isles, the proportion of fat to the rest of the diet is probably about the same in Australia as elsewhere within the Empire.

A conclusion of our experiment which the medical profession seemingly find difficult to assimilate, but which at the same time is one of our clearest results, is that a normal meat diet is not a high protein diet. We averaged about a pound and a third of lean per day and a half a pound of fat (this is about like eating a two-pound broiled sirloin with all the fat such a steak usually has on it). That seems like eating mostly lean; but grow technical and you find, in energy units, that we were really getting three-quarters of our calories from the fat. That is what the scientists meant when they said at the end of our experiment that our diet had proved to be not so very high in protein.

That meat, as some have contended, is a particularly stimulating food I verified during our New York experiment to the extent that it seems to me I was more optimistic and energetic than ordinarily. I looked forward with more anticipation to the next day or the next job and was more likely to expect pleasure or success. This may have a bearing on the common report that the uncivilized Eskimos are the happiest people in the world. There have been many explanations — that an arctic climate is invigorating, that a hunter's life is pleasant, and that the poor wretches just don't know how badly off they are. We now add the suggestion that the optimism may be in part directly caused by what they eat.

Some additional fairly precise things can be said of how we fared during the year on meat. For instance, with Dr. DuBois as pacemaker, we used every few weeks to run around the reservoir in Central Park and thence to his house, going up the stairs two or three at a time, plumping down on cots and having scientific attendants register our breathing, pulse rate, and other crude reactions. These tests appear to show that our stamina increased with the lengthening of the meat period.

Andersen, who had had one head cold after another when working nearly stripped outdoors in his Florida orange grove, suffered only two or three attacks during the meat year in New York, and those light. He did not regain his lost hair; but he reported that there had been a marked decrease in the shedding. As said, according to the reports of the doctors, Andersen was troubled when he came from Florida with certain toxin-producing intestinal micro-organisms in relation to which physicians at that time ordinarily prescribed elimination of meat from the diet. This condition did not trouble him while on the meat.

A phase of our experiment has a relation to slimming, slenderizing, reducing, the treatment of obesity. I was "about ten pounds overweight" at the beginning of the meat diet and lost all of it. This reminds me to say that Eskimos, when still on their native meats, are never corpulent — at least I have seen none. They may be well

fleshed. Some, especially women, are notably heavier in middle age than when young. But they are not corpulent in our sense.

When you see Eskimos in their native garments you do get the impression of fat round faces on fat round bodies, but the roundness of face is a racial peculiarity and the rest of the effect is produced by loose and puffy garments. See them stripped and you do not find the abdominal protuberances and folds which are so numerous at Coney Island beaches and so persuasive against nudism.

There is no racial immunity among Eskimos to corpulence. You prove that by how quickly they get fat and how fat they grow on European diets.

Only one serious fear of the experimenters was realized—our diet for the year turned out low in calcium. This was not demonstrated by any tests upon Andersen or me, and certainly you could not have proved it by asking us or looking at us, for we felt better and looked healthier than our average for the year immediately previous. The calcium deficiency appeared solely through the food anyalsis of the chemists.

Part of our routine was to give the chemists for analysis pieces of meat as nearly as possible identical with those we ate. For instance, lamb would be split down through the middle of the spine and we had the chops from one side cooked for us while they got the chops from the other side to analyze. When the diet was sirloin steaks, they received ones matching ours. The only way in which the diet was not identical with the food analyzed was that Andersen and I followed the Eskimo custom of eating fish bones and chewing rib ends; from these sources we no doubt obtained a certain amount of calcium.

Toward the latter part of the test it became startlingly clear, on paper, that we were not getting enough calcium for health. But we were healthy. The escape from that dilemma was to assume that a calcium deficiency which did not hurt us in one year might destroy us in ten or twenty.

You study bones when you look for a calcium deficiency. The thing to do, then, was to examine the skeletons of people who had died at a reasonably high age after living from infancy upon an exclusive meat diet. Such skeletons are those of Eskimos who are known to have died before European influences came in. The Institute of American Meat Packers were induced to make a subsidiary appropriation to the Peabody Museum of Harvard University where Dr. Earnest A. Hooton, Professor of Physical Anthropology, undertook a thoroughgoing study with regard to the calcium problem in relation to the Museum's collection of the skeletons of meat eaters. Dr. Hooton reported no sign of calcium deficiency. On the contrary, there was every indication that the meat eaters had been liberally, or at least adequately, supplied. They had suffered no more in a lifetime from calcium deficiency than we had in our short year (really short, by the way, for we enjoyed it).

PART III

SCURVY has been the great enemy of explorers. When Magellan sailed around the world four hundred years ago many of his crew died from it and most of the others were at times so weakened that they could barely handle the ships. When Scott's party of four went to the South Pole twenty-three years ago their strength was sapped by scurvy; they were unable to maintain their travel schedule and died. Nor has scurvy been the nemesis of explorers only. Twenty years ago the British Army in the Near East was seriously handicapped, and in October, 1935 an American doctor reported a hundred Ethiopian soldiers per day dying of scurvy. The disease worked havoc during the Alaska and Yukon gold rushes following 1896. Scores of miners died and hundreds suffered.

Medical profession and laity equally believed for more than a hundred years that they knew exactly how to prevent and cure the disease, yet the method always failed on severe test.

The premise from which the doctors started was that vegetables, particularly fruits, prevent and cure scurvy. Since diet consists of animals and plants, the statement came to take the form that scurvy is caused by meat and cured by vegetables. Finally the doctors standardized on lime juice as the best of preventatives and cures. They named it a sure cure, a specific. Law-makers followed the doctors. It is on the statute books of many countries that on long voyages the crews are to be supplied with lime juice and induced or compelled to take it.

Obtained from officers of the Royal Canadian Mounted Police, and from sourdoughs, I have in my diaries and notes many a case of suffering and death caused by scurvy in the Alaska and Yukon gold rushes. The miner generally began to sicken toward the end of winter. He had been living on beans and bacon, on biscuits, rice, oatmeal, sugar, dried fruits and dried vegetables. When he recognized his trouble as scurvy he made such efforts as were possible to get the things which he believed would cure him. Apparently the miners had the strongest faith in raw potatoes. These had to be brought from afar, and there are heroic tales of men who struggled through the wilderness to succor a comrade with a few pounds of them. There were similar beliefs in the virtues of onions and some other vegetables. Curiously, there was either no belief in those vegetables which were obtainable, or else there was a belief that they should be treated in a way which, we now understand, destroys their value. For instance, a man might have been cured, or at least helped, with a salad or leaves or the green bark of trees. What the miners did with the pine needles and willow bark was to cook them for hours and drink the tea. If they had fresh meat they boiled it to shreds and drank the broth. Death

frequently occurred in two to four months from the recognized onset of the disease.

Ignoring the decimation of armies, and the burden of this disease in many walks of civil life through past ages, we turn to the explorers, the class most widely publicized as suffering from and dying of scurvy.

It is usual to rank James Cook of a hundred and fifty years ago with the foremost explorers of all time, part of which fame rests on the assertion that he discovered how to prevent and cure scurvy. Medical books name him as pioneer in the field, saying that we owe to him the conquest of a dread disease. For he demonstrated that with vegetables (again, particularly fruits) scurvy could be prevented on the longest voyages. By statement or inference the books assert that from this developed the knowledge according to which we extract and bottle the juice of the lime, stock ships with it, prevent and cure scurvy.

As above intimated, however, the good physicians, with their faith in lime juice as a specific, overlooked its constant failure upon severe test.

How stoutly the faith was kept is shown by the British polar expedition of Sir George Nares. When he returned to England in 1876 after a year and a half, he reported much illness from scurvy, some deaths, and a partial failure of his program as a result. In his view fresh meat could have saved his men. But the doctors, as we shall see when we consider how they later advised Scott, soon forgot whatever impression was made by Nares. They seem to have squared themselves with the old doctrines by a series of assumptions: that the lime juice on the Nares expedition might have been deficient in acid content; that some of the victims did not take as much of it as needed; and that perhaps it was too much to expect of even the marvelous juice to cope with all the things which tended (in the view of that time) to bring on scurvy — absence of sunlight, bad ventilation, lack of amusement and exercise, insufficient cleanliness.

Particularly because the Nares medical court of inquiry had closed on a note of cleanliness and "modern sanitation," you would think the medical world might have felt a severe jolt when they read how Nansen and Johansen had wintered in the Franz Josef Islands (now Nansen Land) in 1895-96. They had lived in a hut of stones and walrus leather. The ventilation was bad, to conserve fuel; the fire smoked, so that the air was additionally bad; there was not a ray of daylight for months; during this time they practically hibernated, seldom going outdoors at all and taking as little exercise as appears humanly possible. Yet their health was perfect all winter and they came out of their hibernation in as good physical condition as any men ever did out of any kind of Arctic wintering. Their food had been the lean and the fat of walrus.

Tens, if not hundreds, of thousands of scientists in medicine and the related branches must have seen this account, for Nansen's books were best-sellers in practically every language and newspapers were full of the story. Yet the effect was negligible. The doctors and dietitians still continued to pontificate on meat producing

scurvy and on the contributory bad effects of what they called insufficience of ventilation, cleanliness, sunlight, and exercise. They still prescribed lime juice and put their whole dependence on it and other vegetable products.

Excuses for lime juice have persisted to our day. It was, for instance, demonstrated with triumph recently that the meaning of "lime" had changed during the last hundred years, explaining the claim that it worked better in the eighteenth century—then the juice was made from lemons called limes; now it is made from limes called limes.

The antiscorbutic value of lemons may be far greater than that of limes per ounce, but that does not go to the root of the matter. For proof of this consider how Nansen's experience was re-enforced and interpreted by four expeditions during two decades, two of them commanded by Robert Falcon Scott, one by Ernest Henry Shackleton, one by me.

II

Scott, in 1900, sought the most orthodox scientific counsel when outfitting his first expedition. He followed advice by carrying lime juice and by picking up quantities of fruits and other vegetable things as he passed New Zealand on his way to the Antarctic. He saw to it that the diet was "wholesome," that the men took exercise, that they bathed and had plenty of fresh air. Yet scurvy broke out and the subsequently famous Shackleton was crippled by it on a journey. They were pulling their own sledges at the time, so they must have had enough exercise. There was plenty of light with the sun beating on them, and there was plenty of fresh air. To believers in the catchwords and slogans of their day, to believers in the virtues of lime juice, the onset of the scurvy was a baffling mystery.

That it was Shackleton's scurvy which most interfered with the success of the first Scott expedition was particularly unfortunate, if you think of the jealousies it aroused, the enmities it caused. Scurvy, as diseases go, is really one of the cleanest and least obnoxious; but in English the name of it is a term of opprobrium — "a scurvy fellow," "a scurvy trick." Shackleton may have smarted as much under that word-association as he did under the charge that his weakness had been Scott's main handicap. The passion to clear his name, in every sense, drove him to the organization of an expedition which many in Britain considered unethical—a subordinate, with indecent haste and insistence, crowding forward to eclipse his commander.

The crucial element in the first Shackleton expedition, to the students of scurvy, is the fact that Shackleton was an Elizabethan throwback in the time of Edward VII. He was a Hawkins or a Drake, a buccaneer in spirit and method. He talked louder and more than is good form in modern England. He approached near to brag and swagger. He caused frictions, aroused and fanned jealousies, and won the breathless admiration of youngsters who would have followed Dampier and Frobisher with equal enthusiasm in their piracies and in their explorations.

The organization, and the rest of the first Shackleton expedition,

went with a hurrah. They were as careless as Scott had been careful; they did not have Scott's type of backing, scientific or financial. They arrived helter-skelter on the shores of the Antarctic Continent, pitched camp, and discovered that they did not have nearly enough food for the winter, nor had they used such painstaking care as Scott to provide themselves with fruits and other antiscorbutics in New Zealand. Compared with Scott's, their routine was slipshod as to cleanliness, exercise, and several of the ordinary hygienic prescriptions.

What signifies is that Scott's men, with unlimited quantities of jams and marmalades, vegetables and fruits, grains, curries, and potted meats, had been little inclined to add seals and penguins to their dietary. With Shackleton it was neither wisdom nor the acceptance of good advice but dire necessity which drove to such use of penguin and seal that Dr. Alister Forbes Mackay, physician from Edinburgh, who was a member of that Shackleton expedition and later physician of my ship the *Karluk*, told me he estimated half the food during their stay in the Antarctic was fresh meat.

In spite of the lack of care (indeed, as we now see it, because of that lack), Shackleton had better average health than Scott. There was never a sign of scurvy; every man retained his full strength; and they accomplished that spring what most authorities still consider the greatest physical achievement ever made in the southern polar regions. With men dragging the sledges a considerable part of the way, they got to latitude 88° 23′ S., practically within sight of the Pole.

Scott began his second venture as he had begun the first, by asking the medical profession of Britain for protection from scurvy and by receiving from them once more the good old advice about lime juice, fruits, and the rest. In winter quarters he again placed reliance on that advice and on constant medical supervision, on a planned and carefully varied diet, on numerous scientific tests to determine the condition of the men, on exercise, fresh air, sanitation in all its standard forms. The men lived on the foods of the United Kingdom, supplemented by the fruit and garden produce of New Zealand. Because they had so much which they were used to, they ate little of what they had never learned to like, the penguins and seals.

Once more they started their sledge travel after a winter of sanitation. The results had previously been disappointing; now they were tragic. While scurvy did not prevent them from reaching the South Pole, it began to sap their strength on the return and progressed so rapidly that the growing weakness prevented them, if only by ten miles, from being able to get back to the final provision depot.

Those who have ignored the scurvy have sometimes claimed that if Scott had reached the depot he would have been able to reach eventually the base camp 150 miles away. This becomes more than doubtful when you realize that the progressive decrease of vigor, both mental and bodily, was not going to be helped by even the largest

meals, if those meals were food lacking antiscorbutic value.

The story of Scott and his companions, especially through the last few weeks, is among the noblest in any language; through it they became national heroes and world heroes. But in the speech of their countrymen (though not in many another European tongue), scurvy sounds unclean. It appeared necessary to Scott's surviving comrades, and to those in Britain who knew the truth, to take care that the tabooed word should not sully a glorious deed.

To suppress the association of a disease with the beauty and heroism of Scott's death may have been worth while at the time; but it can scarcely be deplored by anyone —and must be praised by scientists — that Commander Edward R. G. R. Evans, now Admiral, Scott's second-in-command, after a time gave out the scurvy information, including the statement that he himself had been ill.

It is irrational, at least now that emotions have calmed, to blame Scott. No one was to blame, for they all acted according to the light of their day. If anybody was to blame it was primarily those who gave medical advice to the expedition before it sailed; secondarily, it was the chief medical officer, rather than the commanding officer, of the expedition.

It seems strange, now, that a comparison of the Scott and Shackleton experiences did not fully enlighten the doctors on the true inwardness of scurvy; but of course part of the explanation is that the Scott medical information was suppressed. Therefore, it remained for my own expeditions to demonstrate, so far as polar expeditions are concerned, and for the Russell Sage experiments to call to the attention of the medical profession, the most practical and only simple way of curing scurvy. For no matter how good the juice of limes (or lemons), it is difficult to carry, it deteriorates, and you may lose it, as by a shipwreck. The thing to do is to find your antiscorbutics where you are, pick them up as you go.

On my third expedition it happened, as circumstantially related in a book called *The Friendly Arctic*, that three men came down with scurvy through disobeying the instructions of the commander and living without his knowledge for two or three months chiefly on European foods when they were supposed to be living chiefly on meat.

It seems to take from one to three months for even a bad diet to produce recognizable scurvy, but thereafter developments are rapid through the next few weeks. In the case of my men it was about three weeks (as they later thought) after they noticed the trouble, and about ten days after they complained of it to me, when one of them was so weak we had to carry him on a sledge, while the other was barely able to stagger along, holding on behind. By then every joint pained, their gums were as soft as "American" cheese, their teeth so loose that they came out with almost the gentlest of pulls.

We were 60 or 80 miles from land on drifting sea ice when the trouble started, and we hastened ashore to get a stable camp for the invalids. It would have been no fun, with sick men on your hands, if the site of your camp started

disintegrating under pressure and tumbling about.

We reached an island (about 900 miles north of the Arctic Circle) the coast of which was known although the interior had never been explored. We traveled a few miles inland, established a camp, hunted caribou (there were two of us well, out of four) and began the all-meat cure. Fuel was pretty scarce, so we cooked only one meal a day; besides, I thought raw food might work better. We cooked the breakfast in a lot of water. The patients finished the boiled meat while it was hot and kept the broth to drink during the rest of the day. For their other meals they ate slightly frozen raw meat, with normal digestion and good appetite. We divided up the caribou in ordinary Eskimo style, so the dogs got organs and entrails, hams, shoulders, and tenderloin, while the invalids and we hunters got heads, briskets, ribs, pelvis, and the marrow from the bones.

On this diet all pain disappeared from every joint within four days and the gloom was replaced by optimism. Inside of a week both men said that they had no realization of being ill as long as they lay still in bed. In two weeks they were able to begin traveling, at first riding on the sledges and walking alternately. At the end of a month they felt as if they had never been ill. No signs of the scurvy remained except that the gums, which had receded from the teeth, only partly regained their position.

By comparing notes later with Dr. Alfred Hess, the leading New York authority on scurvy, I found that when I was getting these results with a diet from which all vegetable elements were absent, he was getting the same results in the same length of time through a diet where the main reliance was upon grated raw vegetables and fruits and upon fresh fruit juices.

There is no doubt, as the quantitative studies have shown, that the percentage of Vitamin C, the scurvy-preventing factor, is higher in certain vegetable elements than in any meats. But it is equally true that the human body needs only such a tiny bit of Vitamin C that if you have some fresh meat in your diet every day, and don't overcook it, there will be enough C from that source alone to prevent scurvy. If you live exclusively on meat you get from it enough vitamins not only to prevent scurvy but, as said a few pages back, to prevent all other deficiency diseases.

Closing the subject of vitamins in relation to long expeditions, we had better emphasize that there has recently been such progress in the extraction, concentration, and storage of Vitamin C that it is now possible to carry with you enough to last several years and of such quality that it will not deteriorate to the point of uselessness. But why carry coals to Newcastle? If you are in the tropics, pick a fruit or eat a green; if you are at sea, throw a line outboard and catch a fish; if you are in the Antarctic, use seals and penguins; if in the Arctic, hunt polar bears and seals, caribou and the rest of the numerous game. True enough, if you make a journey inland into the Antarctic Continent or toward the center of Greenland, where there is no game because the land is permanently snow-covered, you have to carry food with you. In that

case you might as well take lemon juice or some dependable extract.

III

A bulletin conspicuous in the subways co-operated some time ago with the New York Commissioner of Health by displaying this notice:

"FOR SOUND TEETH
BALANCED DIET with
VEGETABLES: FRUIT: MILK
BRUSH TEETH
VISIT DENTIST REGULARLY
—Shirley W. Wynne, M.D.,
Commissioner of Health"

During the same time the ether was full and the magazine pages were crowded with advertising which told you that mouth chemistry is altered by a paste, a powder, or a gargle so as to prevent decay, that a clean tooth never decays, that a special kind of toothbrush reaches all the crevices, that a particular brand of fruit, milk, or bread is rich in elements for tooth health. There were toothbrush drills in the schools. Mothers throughout the land were scolding, coaxing, and bribing to get children to use the preparations, eat the foods, and follow the rules that insured perfect oral hygiene.

Meantime there appeared a statement from Dr. Adelbert Fernald, Curator of the Museum of the Dental School, Harvard University, that he had been collecting mouth casts of living Americans, from the most northerly Eskimos south to Yucatan. The best teeth and the healthiest mouths were found among people who never drank milk since they had ceased to be suckling babes and who never in their lives tasted any of the other things recommended for sound teeth by the New York Commissioner of Health. These people, Eskimos, never use tooth paste, tooth powder, tooth brushes, mouth wash, or gargle. They never take any pains to cleanse their teeth or mouths. They do not visit their dentist twice a year or even once in a lifetime. Their food is exclusively meat. Meat, be it noted, was not mentioned in the advertisement issued by Dr. Wynne.

Teeth superior on the average to those of the presidents of our largest tooth-paste companies are found in the world to-day, and have existed during past ages among people who violate every precept of current dentifrice advertising. Not all of them have lived exclusively on meat; but so far as an extensive correspondence with authorities has yet been able to show me, a complete absence of tooth decay from entire communities has never existed in the past, and does not exist now, except among people in whose diet meat is either exclusive or heavily predominant.

Our Bellevue experiments threw a light on tooth decay, but the key to the situation lies more in the broad science of anthropology. I now give, by sample and by summary, things personally known to me from anthropological field work:

My first anthropological commission was from the Peabody Museum of Harvard University and when they sent John W. Hastings and me to Iceland in 1905. We found in one place a medieval graveyard that was being cut away by the sea. Skulls were rolling about in the water at high tide; at low tide we gathered them

and picked up scattered teeth here and there. As wind and water shifted the sands we found more and more teeth until there was a handful. Later we got permission to excavate the cemetery, and eventually we brought with us to Harvard a miscellaneous lot of bones which included 80 skulls and, as said, a great many loose teeth.

The collection has been studied by dentists and physical anthropologists without the discovery of a single cavity in even one tooth.

The skulls in the Hastings-Stefansson collection represent persons of ordinary Icelandic blood. There were no aborigines in that island when the Irish discovered it some time before 800 A.D. When the Norsemen got there in 860 they found no people except the Irish. It is now variously estimated that in origin the Icelanders are from 10 per cent to 30 per cent Irish, 40 per cent to 60 per cent Norwegian, the remainder, perhaps 10 per cent, from Scotland, England, Sweden and Denmark.

None of the peoples whose blood went into the Icelandic stock are racially immune to tooth decay, nor are the modern Icelanders. Then why were the Icelanders of the Middle Ages immune?

An analysis of the various factors makes it pretty clear that their food protected the teeth of the medieval Icelanders. The chief elements were fish, mutton, milk, and milk products. There was a certain amount of beef and there may have been a little horse flesh, particularly in the earliest period of the graveyard. Cereals were little imported and might be used for beer rather than porridge. Bread was negligible and so were all other elements from the vegetable kingdom, native or imported.

My mother, who was born on the north coast of Iceland, remembered from the middle of the nineteenth century a period when bread still was as rare as caviar is in New York today—she tasted bread only three or four times a year and then only small pieces when she went with her mother visiting. So far as bread existed at her own house, it was used as a treat for visiting children. The diet was still substantially that of the Middle Ages, though the use of porridge was increasing. She did not remember hearing of toothache in her early youth but did remember accounts of it as a painful rarity about the time when she left for America in 1876. Soon after arrival in the United States (Wisconsin, Minnesota, Dakota) and in Canada (Nova Scotia, Manitoba) the Icelandic colonists became thoroughly familiar with the ravages of caries. They probably had teeth as bad as those of the average American long before 1900.

There is then at least one case of a north-European people whose immunity from caries (to judge from the Hastings-Stefansson collection and common report) approached 100 per cent for a thousand years, down to approximately the time of the American Civil War. The diet was mainly from the animal kingdom. Now that it has become, both in America and Iceland, approximately the same as the average for the United States or Europe, Icelandic teeth show a high percentage of decay.

I began to learn about another formerly toothacheless people when I joined the Mackenzie River Eskimos in 1906. Some of them had

been eating European foods in considerable amount since 1889, and toothache and tooth decay were appearing, but only in the mouths of those who affected the new foods secured from the Yankee whalers. The Mackenzie people agreed that toothache and cavities had been unknown in the childhood of those then approaching middle age, while there were many of all ages still untouched, the ones who kept mainly or wholly to the Eskimo diet. Here, and in many other places, this is somewhere between 98 per cent and 100 per cent from animal sources. There are districts, like parts of Labrador and of western and southwestern Alaska, where even before the coming of Europeans there was considerable use of native vegetables. Probably, however, the vegetable element nowhere furnished as much as 5 per cent of the average yearly caloric intake of the primitive Eskimos, even in southwestern Alaska.

Dr. Ales Hrdlicka, Curator of Anthropology in the National Museum, Washington, writes me that he knows of no case of tooth decay among Eskimos of the present or past who were uninfluenced by European habits. Dr. S. G. Ritchie, of Dalhousie University, wrote after studying the skeleton collection gathered by Mr. Diamond Jenness on my third expedition: "In all the teeth examined there is not the slightest trace of caries."

I brought about 100 skulls of Eskimos, who had died before Europeans came in, to the American Museum of Natural History, New York. These have been examined by many students, but no sign of tooth decay has yet been discovered.

Dr. M. A. Pleasure examined at the American Museum of Natural History 283 skulls said to be Eskimo of pre-European date. He found a small cavity in one tooth; but when the records were checked it turned out that the collector, Rev. J. W. Chapman of the Episcopal Board of Missions, who now lives in New York City, had sent that skull to the Museum as one of an Athapasca Indian, not of an Eskimo.

The slate is, therefore, clean to date. Not a sign of tooth decay has yet been discovered among that one of all peoples which most completely avoids the foods, the precepts, and the practices favored for dental health by the New York Commissioner of Health, the average dentist, the toothbrush drill-masters of the schools, and the dentifrice publicists.*

IV

When addressing conventions and societies of medical men, I usually state the oral hygiene case somewhat as above, though in more detail. If there is rebuttal from the floor, it frequently takes the form of contending that the tooth health of primitive people is due to their chewing a lot, and to their eating coarse food. The advantage of that argument to the dentist, whose best efforts have failed to save your teeth, is obvious. It gives him an excuse. He can from the doctrine make a case that not all your care, even when supported by his skill and science, can preserve teeth in a generation of soft foods that give no exercise to the teeth and no friction to the gums.

But it is deplorably hard to square anthropology with this comfortable excuse of the dentist. Among the best teeth of a mixed-diet world are those of a few South Sea Islanders who as yet largely keep to their native diets. Similar or better tooth condition is described, for instance, from the Hawaiian Islands by the earliest visitors. But can you think of a case less fortunate for the chewing-and-coarse-diet advocates? The animal food of these people was mainly fish, and fish is soft to the teeth, whether boiled or raw. Among the chief vegetable element was poi, a kind of soup or paste. Then they used sweet potatoes.

It would be difficult to find a New Yorker or Parisian who does not chew more, and use coarser food, than the South Sea Islanders did on the native diets which gave them in at least some cases 97 per cent freedom from caries, a record no block on Park Avenue can approach.

Nor do Eskimos chew much, as compared with us. So far as their meat is raw it can be chewed like a raw oyster—slips down similarly. When perfectly fresh meat is cooked, two main causes determine toughness: the age of the beast and the manner of cooking. The chief food animal of inland Eskimos is the caribou. A young caribou is as fleet as a heifer; an old one is as slow as a cow. Therefore the wolves get the clumsy old which drop behind when the band flees, and the Eskimos seldom have a chance to secure an animal that is more than four or five. Such young caribou are not tough, no matter how cooked.

I do not know a corresponding logical demonstration for seals, but I can testify from helping to eat thousands that their meat is never tough—at least not in comparison with the beefsteaks you sometimes get in New York chophouses.

Then there are Eskimos who live practically exclusively on fish. As said, you can't chew them when they are raw; there is not much chewing when they are eaten boiled. The only condition under which fish become tough, or rather hard, is when they are dried. Some Eskimos use dried fish; others do not.

There is for separated districts a wide difference in the amount of Eskimo chewing, but no one has reported that the health of the teeth is better among the heavier chewers. How could it be when as yet no caries has been found either among the lightest or heaviest masticators?

It is used as a second line of defense by the mastication advocates that even if Eskimos perhaps don't chew their food so very much they do chew skins a great deal. Their chewing of leather is far less than you might believe from what has been said by a particular kind of writer and pictured in certain movies. In any case, skin chewing is mainly by the women, and it is not easy to bring under the conditions of modern scientific thought the idea that the wife's chewing preserves her husband's teeth.

Once at a talk to a medical group I encountered a further argument. Is it not true that Eskimo men use the teeth a great deal in their crafts? Do they not bite wood, ivory, or metal to hold, pull out, twist, and so on? The best I could think of was to agree that Eskimos

* The incidence of caries among civilized Eskimos, who now eat a mixed diet, is heavy.

pull nails with their teeth, and to follow by suggesting that it is more likely they bite nails because they have good teeth than that they have good teeth because they bite nails.

There are several reasons why the teeth of many Eskimos wear down rapidly. They usually meet edge to edge, where ours frequently overlap, and that tends to cause wear. Some Eskimos wind-dry fish or meat, sand gets in, and to an extent makes them like sandpaper. Both sexes, but especially men, use their teeth for biting on hard materials. Both sexes, but especially the women, use their teeth for softening skins. A wearing toward the pulp may, therefore, take place in early middle life. What then happens is stated by Dr. Ritchie (whom we have already quoted) with relation to the Coronation Gulf Eskimos:

"Coincident with this extreme wear of the teeth the dental pulps have taken on their original function with conspicuous success. Sufficient new dentine of fine quality has been formed to obliterate the pulp chambers and in some cases even the root canals of the teeth. This new growth of tissue is found in every case where access to the pulp chambers has been threatened. There has therefore been no destructions of the pulps through infection and consequently alveolar abscesses are apparently unknown."

Total absence of caries from those who live wholly on meat is then definite. Cessation of decay when you transfer from a mixed to a meat diet happens usually, perhaps always. The rest of the picture is not so clear.

Caries has been found in the teeth of mummies in Egypt, Peru, and in our own Southwest. These ancient peoples were mixed-diet eaters, depending in considerable part on cereals. Their teeth were better than ours, though not so good as those of the Eskimos.

If you want a dental law, you can approximate it by saying that the most primitive people usually have the best teeth. You can add that in some cases a highly vegetarian people, while not attaining the 100 per cent perfection of meat eaters, do, nevertheless, have very good teeth as compared with ours.

It is contended by the Hawaiian Sugar Planters Association Health Research Project that the shift from good to execrable teeth among the mixed-diet Polynesians there has been due to a change from the native taro and yams to cereals. I have seen no comment of theirs upon the (I should think) great increase of sugar consumption that has been synchronic with the deterioration of Hawaiian teeth.

On the view that diet is the greatest factor in saving teeth, the anthropologists have been getting support from experiments conducted by institutions and by scattered students. Some dentists are here contributing nobly to a research, and to a campaign of education, that seems bound to deplete their income. My probing has not revealed thus far corresponding unselfishness among the dentifrice manufacturers.

V

A serious mouth disease, next after caries, is pyorrhoea. He who runs cannot read the marks so readily on human skeletons; but it seems at least probable that the

medieval Icelanders, the Eskimos, and others who have left teeth free from cavities, were also free from, or at least not severely afflicted by, pyorrhoea. Similarly, the modern investigators have found Eskimos who are still living on their native foods to have an unusually good average condition of oral health, therewith absence of pyorrhea.

One of the things we noticed in the general well-being of our New York year on meat and similar years in the Arctic was the absence of headaches. I used to have them frequently before going north and have them occasionally whenever I am on a mixed diet. The whys and wherefores are not clear, and what we say on this point is more tentative than any other part of this statement.

It was noticed in the X-ray pictures during our New York meat year that we had far less gas in the intestinal tract when on meat than when on a mixed diet—practically no gas. The work of Dr. John C. Torrey showed that neither did digestion and elimination produce those offensive smells which are found in vegetarianism and on a mixed diet. But whether the freedom from a certain kind of intestinal food decomposition was what led to the freedom from headache is no more than a working hypothesis.

The prevention of headache by abstaining from vegetables has been recorded in books. An outstanding case is that of Francis Parkman, the historian, who suffered with headaches all his life except, as he states, during one period when he was living with an Indian tribe chiefly or exclusively on meat. This testimony, though by an eminent man widely read, and though a fair sample of the testimony of meat eaters, commanded little attention from the physicians. It should be said in their defense, however, that Parkman himself does not proclaim the experience as a triumphant discovery. He rather puts it the other way about, that in spite of being compelled to live on meat, he was free from the headaches that plagued him the rest of his days.

Professor Raymond Pearl, nearly twenty years ago, while he was at the Maine Agricultural Experiment Station, proved that chickens know more than professors about what is good for chickens to eat. Now several experiments appear in a good way to establish that children, if given complete freedom to choose among foods undisguised by sauces and artificial flavors, will select better for their own health and strength than the mother or the child specialist. One of the things frequently noticed about these children is that they eat large quantities of a single item which they happen to like. Our living for years on a single item which we liked was from that point of view no more than carrying forward a childhood tendency.

VI

More than twenty-five years have passed since the completion of my first twelve months on meat and more than six years since the completion in New York of my sixth full meat year. All the rest of my life I have been a heavy meat eater, and I am now fifty-six. That should be long enough to bring out the effects. Dr. Clarence W. Lieb has reported in the American Journal of Digestive Diseases and Nutrition that I still run well

above my age average on those points where meat has been supposed to cause deterioration. The same is the verdict of my own feelings. Rheumatism, for instance, has yet to give me its first twinge.

The broadest conclusion to be drawn from our comfort, enjoyment, and long-range well-being on meat is that the human body is a sounder and more competent job than we usually give it credit for. Apparently you can be healthy on meat without vegetables, on vegetables without meat, or on a mixed diet.

Two stories summarize one of the most interesting sides of the case, the dental. In 1903 I heard the Dean of the dental school of the University of Pennsylvania say in a lecture that he thought dentists to that year had done more harm than good, but would thereafter be doing more good than harm. In 1928, when I told this to Dr. Percy R. Howe, Director of the Forsyth Dental Infirmary for Children, he said he thought the good Dean had been premature by at least twenty years. As I understand Dr. Howe, much good was done in particular cases by dentists long ago, but it is only within the past ten years or so that the average for good has overbalanced the harm by any very heavy proportion.

While meat eaters seem to average well in health, we must in our conclusion draw a caution from the most complete modern example of them, the Eskimos of Coronation Gulf.

Mr. Diamond Jenness, now chief anthropologist for the Canadian Government at Ottawa, concluded from his experience in the Gulf, when he was anthropologist on my third expedition, that the two chief causes of death were accidents and old age. This puts in a different form my saying that these survivors of the stone age were the healthiest people I have ever lived among. I would say the community, from infancy to old age, may have had on the average the health of an equal number of men about twenty, say college students. The danger is that you may reason, with too much confidence in a single factor, from this good health to a necessarily great average longevity. So far as we can tell, the Eskimos, before the white men upset their physiological as well as their economic balance, lived on the average at least ten years less than we. Now their lives average still shorter; but that is partly from communicated diseases.

If it be true that the good average health of meat eaters is not necessarily accompanied by a great average length of life, the explanation may be along the line of what has been said, *ante*, that I found the exclusive meat diet in New York to be stimulating—I felt energetic and optimistic both winter and summer. Perhaps it may be considered that meat is, over all, a stimulating diet, in the sense that metabolic processes are speeded up. You are then living at a faster rate, which means you would grow up rapidly and get old soon. This is perhaps confirmed by that early maturing of Eskimo women which I have heretofore supposed to be mainly due to their almost complete protection from chill—they live in warm dwellings and dress warmly so that the body is seldom under stress to maintain by physiological processes a temperature balance. It may be that meat

as a speeder-up of metabolism explains in part both that Eskimo women are sometimes grandmothers before the age of twenty-three, and that they usually seem as old at sixty as our women do at eighty.

So you could live on meat if you wanted to; but there is no driving reason why you should. Moreover, vegetables are fundamentally economical. You can get several times more food value from an acre of corn than from the pigs that ate the corn.

The thing to do then, probably, is to go on as you have been doing, but adding to your mental equipment, if it be a novelty, the idea that several at least of the disadvantages of a meat diet are compensated for by advantages.

STATEMENT OF KARSTEN ANDERSEN

Brunswick, Georgia

February 19, 1936

Dear Mr. Stefansson:

I have read the Harper series with a great deal of interest. As a partner in the Russell Sage experiment, there are some comments I would like to make on what seem to me omissions and understatements.

You do not discuss blood pressure—that red meat has been supposed to contribute to high blood pressure. Mine had been above normal on a mixed diet and was so at the beginning of the experiment. It fell to normal during the first few months of the meat diet and remained so, slightly below average normal, during the course of the experiment.

You do not mention that digestion was more nearly complete on the meat diet. I believe the conclusion was something like that, whereas on a mixed diet we digested only 85% of our food, on the meat diet we digested 95%.

You have not brought out the point that when we changed from a mixed diet to meat the change in the intestinal flora was not what the doctors had expected.

You say in one of the articles "*practically* no gas." I would say remarkably free from gas. I do not remember having had any gas at all while on the meat diet—at least it seemed so comparing with the condition of a mixed diet.

Sincerely yours,

KARSTEN ANDERSEN.

STATEMENT OF DR. CLARENCE W. LIEB

400 Madison Ave.
New York

February 21, 1936

I have read the articles by Vilhjalmur Stefansson, "Adventures in Diet," which appeared in *Harper's Magazine* for November, December, January, last. In connection with their re-publication the following may be of value.

While the magazine statement seems to me accurate so far as it goes, I feel strongly that scientific men should take it chiefly as a background and introduction, getting their professional view of the Russell Sage experiment from the technical papers which have been published in connection with it. I am, therefore, glad to know that a bibliography of the chief of these will be included with the re-publication of the *Harper's* series. Most desirable would be to have eventually a fuller treatment, no doubt in book form, which would assemble and coordinate all that has been published, make available material not yet in print, and interpret the whole against a broad medical and anthropological background.

In 1925 a number of my New York medical colleagues and I made a thorough survey of Stefansson, with results as published in the *Journal* of the American Medical Association for July 3, 1926. We found no evidence of the ill effects which a good many at that time expected in a man of forty-six who had been anything from a moderate to a heavy meat eater all his life and who had lived on literally nothing but meat and water for an aggregate of several years.

On an average once a year since 1925 I have examined Stefansson, and since 1928 I have given similar examinations to his colleague of the experiment, Karsten Andersen. The results are given in papers written by myself exclusively or by me in collaboration with scientific colleagues, the most pertinent of which are cited in the bibliography. The last examinations of both Stefansson and Andersen are within the current year. A summary of data might be something to this effect:

During the year on exclusive meat diet, 1928-9, both men said they felt better than average for them. Both looked it and were, insofar as I could tell through the clinical and laboratory studies which I made of them before, during and after. The like, I believe, was the verdict of the rest of those intimately connected with the experiment.

Stefansson and Andersen are in health today at or above the average for their years. Neither, so far as I can tell, has to date suffered any ill effect either from the Russell Sage experiment or from the numerous previous years during which they had lived exclusively or mainly on meat.

Very truly yours,

CWL:N C. W. LIEB.

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The background of the period during which Stefansson lived an aggregate of more than five years exclusively on meat and water, and more than five additional years mainly on meat and water, is found in the following books:

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Anthropological Papers of the American Museum of Natural History, Vol. XIV, New York 1914-1919.

The Friendly Arctic, New York 1921.

Hunters of the Great North, New York 1922.

These narratives are concerned also with the exclusive meat diets of Eskimos and northerly forest Athapascans. Karsten Andersen, Stefansson's colleague of the Russell Sage experiments, was for four of the five years a member of the third Stefansson expedition of which the narrative is *The Friendly Arctic.* That book includes a statement of how Andersen in 1917 developed scurvy and was cured of it.

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